IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Aggarwal et al.
App. No	:	10/665,693
Filed	:	September 17, 2003
For	:	SYSTEM FOR THE IMPROVED HANDLING OF WAFERS WITHIN A PROCESS TOOL
Examiner	:	Gregory W. Adams
Art Unit	:	3652
Conf No.	:	6237

REPLY BRIEF TO EXAMINER'S ANSWER

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Reply Brief is in response to the Examiner's Answer mailed on November 25, 2008, and relates to a corrected Appeal Brief filed October 20, 2008. Appellants hereby submit this Reply Brief pursuant to 37 C.F.R. § 41.41.

Reply to Examiner's Arguments begin on page 2 of this paper.

REPLY TO EXAMINER'S ARGUMENTS

A. Tanaka's Buffer Parts are Designed for Heating and Cooling, and only the Cooling is Relevant to the Claimed Purging

In the Examiner's Answer to the Appeal Brief, the Examiner asserts that "Hofmeister does not disclose purgeability which Tanaka's [*sic*] adds to prevent contamination of a substrate handling chamber as noted above." *See* Examiner's Answer, page 10. However, this assertion overlooks the fact that the exhaust systems 75, 96 taught in Tanaka are necessitated by the fact that the *single wafer* buffer stations 44, 46 of Tanaka are preheating or cooling stations.[1] Hence, unless interested in preheating or cooling *a single wafer* prior to or after transport into or from a processing chamber, one of ordinary skill in the art would have no reason to combine Hofmeister with Tanaka, contrary to the Examiner's assertion above. To be clear, Tanaka teaches post-process cooling or preheating wafers in a buffer part 44, 46. Tanaka does *not* teach purging the buffer part for any reason unrelated to cooling or heating. As a result, unless interested in heating or cooling the wafer, one of ordinary skill in the art would have had no reason to modify

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[1] Tanaka clarifies that the exhaust systems in the buffer stations are related to the cooling and preheating functions of the buffer station (emphasis added):

> In order to reduce the airtight space, a reinforcing member 74 having an open roof portion and two laterally-elongated transfer ports 72, 72 (see FIG. 4) on the side wall is provided on the top closing lid 64. The wafer W is capable of being introduced or carried out via the two transfer ports 72, 72 in two directions. If the airtight space is reduced, there is an advantage in that it is possible to reduce a gas exhausting time to reduce a heating time. In addition, a first exhaust system 75 (see FIG. 2) connected to a vacuum pump (not shown) or the like is connected to the side wall of the top protruding container 54 *so as to be capable of exhausting gas which is discharged from the surface of the wafer during the heating of the wafer.*
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> . . .
>
> In addition, a cooling gas system 94 for selectively introducing a cooling gas, such as a cooled N_2 gas, and a second exhaust system 96 connected to a vacuum pump (not shown) or the like, are connected to the bottom of the bottom protruding container 78. *By the cooling gas system 94 and the second exhaust system 96, it is possible to introduce a cooling gas and discharge the introduced cooling gas during the cooling of the wafer.*

See Tanaka, col. 6, l. 63–col.7, l. 8 and col. 7, ll. 36–45.

Hofmeister to "prevent contamination of a substrate handling chamber" as asserted by the Examiner.

Moreover, it is only Tanaka's cooling function (and not its heating function) that resembles purging. Tanaka's cooling function involves delivering a cooling gas to the buffer part via a line 94 (Fig. 2), and exhausting the cooling gas via a line 96. Tanaka, col. 7, lines 36-44. Tanaka's heating function merely involves evacuating the buffer part, and is therefore not purging. Col. 7, lines 3-8.

B. Tanaka's Buffer Part Only Cools a Single Wafer

The Examiner incorrectly asserts that Tanaka discloses a "top shelf 64 upon which a wafer is placed and a bottom shelf 80 upon which an additional wafer is placed." *See* Examiner's Answer, page 10. This is clearly incorrect as Fig. 2 shows the preheating unit 48 with a separate sealing member 66 from the sealing member 82 of the cooling unit 50. Therefore, the preheating 48 and cooling 50 units are *separate chambers* within each buffer part 44, 46, and do not constitute a single chamber "having a rack defining multiple shelves for holding substrates," as recited in Claims 1 and 10, or "a buffer station rack within the buffer station being configured to have multiple slots for holding substrates," as recited by Claim 14. As explained in the Appellants' Brief, Tanaka teaches using supporting pins 90 (Fig. 2) to support only a single wafer being cooled. Tanaka, col. 6, lines 58-62.

C. Tanaka Did Not Make it Obvious to Cool Multiple Wafers Simultaneously

Furthermore, even if one of ordinary skill in the art would have had a reason to modify Hofmeister to provide for post-process cooling, he or she would not have modified the reference in the manner asserted by the Examiner so as to meet the claims. As explained in the Appeal Brief, in combining Hofmeister with Tanaka, one of ordinary skill in the art would have at most added to Hofmeister a *single wafer* preheating unit 48 or cooling unit 50 as taught in Tanaka, rather than converting one of Hofmeister's buffer cassettes B1-B4 into a separately purgeable chamber. As is commonly known in the art, cooling a hot wafer from a processing temperature to room temperature must be done so as to maintain a degree of temperature uniformity across the wafer. The presence of substantial temperature gradients across the wafer can lead to thermal

shock, which can cause defects such as warping and crystallographic slip. Hofmeister discloses that each of its buffer cassettes B1-B4 holds 26 wafers at a 10 mm pitch. Hofmeister, col. 3, lines 36-37. Converting Hofmeister's buffer cassettes B1-B4 into cooling units for multiple wafers would have been understood to result in temperature non-uniformities across the wafers because the cooling gas would not easily flow between the wafers and would therefore cool the outer edges of the wafers more than their interior portions. This is particularly true where the cooling gas is drawn out by a vacuum source (as taught by Tanaka, col. 7, lines 36-41) before it would have much of a chance to migrate between the stacked wafers. That is why post-process wafer cooling is typically conducted only on one wafer at a time.

D. The Examiner Incorrectly Equates Tanaka's Disclosure of "Timing" to Multiple Wafer Cooling

Tanaka, in the Background section, states that "there are some cases where a buffer part capable of causing a plurality of wafers W to stand by for timing is provided in place of the load-lock chambers 8A and 8B [of Fig. 8] capable of being evacuated." Tanaka, col. 2, lines 24-27. According to the Examiner, "Tanaka teaches that 'timing' equates to a supplemental process such as cooling, i.e. wafer in transit from a process chamber to a cassette." Examiner's Answer, page 10. Prior to the excerpt in question, Tanaka discusses times associated with certain operations, including alignment (col. 1, lines 58-59), preheating or evacuation (col. 1, lines 66-67), processing (col. 2, lines 8-10), and single wafer cooling (col. 2, lines 16-18). Thus, only one of these four "timing" statements in Tanaka involves cooling, and it only involves *single wafer* cooling. Tanaka's disclosure of a buffer part capable of causing a plurality of wafers W to stand by "for timing" is simply too vague to support the Examiner's conclusion that Tanaka discloses purging/cooling of multiple wafers simultaneously, particularly in view of the fact that Tanaka itself discloses only *single wafer* cooling in its buffer part 44, 46, as explained above. Accordingly, Appellants submit that the Examiner's statement is incorrect.

E. Lack of Hofmeister's Need for Sealed Buffers is Relevant to Obviousness

The Examiner states that "[w]hether a skilled artisan would have added Tanaka's purgeable buffer based on the lack of need in Hofmeister is irrelevant to the question of

obviousness. The issue is whether taken as a whole the cited prior art discloses the need to add a feature in a modifying reference. In this case, Hofmeister does not disclose purgeability which Tanaka's [*sic*] adds to prevent contamination of a substrate handling chamber as noted above." Examiner's Answer, page 10. Appellants respectfully disagree. Tanaka discloses preventing two different forms of contamination of a substrate transfer chamber: (1) gas released from a wafer while being heated in the buffer part 44, 46; and (2) cooling gas escaping the buffer part 44, 46 during convective wafer cooling. Tanaka, col. 3, lines 41-47. However, Hofmeister does not heat or cool wafers in its buffer cassettes B1-B4. Thus the contamination problem that Tanaka solves by sealing its buffer parts simply does not apply to Hofmeister. The fact that Hofmeister does not need the solution offered by Tanaka is absolutely relevant to whether a skilled artisan would undertake the time and effort to modify Hofmeister as proposed by the Examiner. Indeed, if a proposed modification serves no purpose, then why would a skilled artisan bother to modify Hofmeister?

The Examiner may be implicitly arguing that it was obvious to conduct wafer heating or cooling in Hofmeister's buffer cassettes B1-B4, and that it was therefore obvious to seal them from the remainder of Hofmeister's transfer chamber. However, as noted above, Tanaka did not make it obvious to convectively cool *multiple wafers* in a cassette.

F. Aswad is Relevant to Obviousness of Combining Hofmeister and Tanaka

The Examiner states that "the issue is what the cited prior art discloses in combination, and Aswad's teaching may be a disadvantage but does not prevent a combination." Again, the Examiner is incorrect. The issue is whether it was obvious to combine Hofmeister and Tanaka in the manner claimed. Aswad (U.S. Patent No. 6,073,366) is representative evidence of non-obviousness, because Aswad plainly indicates that it is not feasible to conduct wafer cooling in cassette shelves (of the type presumably used in Hofmeister's buffer cassettes B1-B4). Aswad teaches that even heat-resistant cassette shelves can only withstand wafer temperatures as high as 170°C (Aswad, col. 1, lines 25-38), while Tanaka teaches cooling wafers from 600°C (Tanaka, col. 9, lines 5-10). Thus, Tanaka is strong evidence that there was no reasonable expectation of success in the Examiner's proposed combination of Hofmeister and Tanaka, and is therefore highly relevant to the obviousness inquiry.

CONCLUSION

For the reasons presented above, Appellants submit that this application is allowable over the art of record and respectfully request the same.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 1/26/09

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